

# PID Update

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# Outline of framework

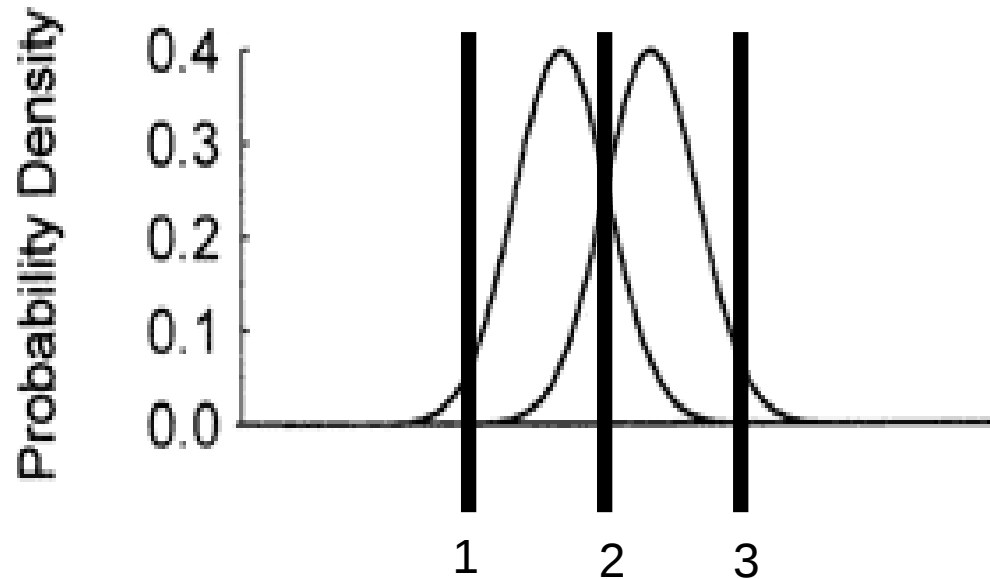
- Using MC data, probability density functions (PDFs) created for different particle hypotheses and PID variables.
- Tracks from data passed through Global Reconstruction then have PID variables computed, and these are compared with the PDFs to obtain a log-likelihood value for each particle hypothesis.

# Explaining PDFs and LLs

To distinguish between PIDs, the difference between log likelihood values is used.

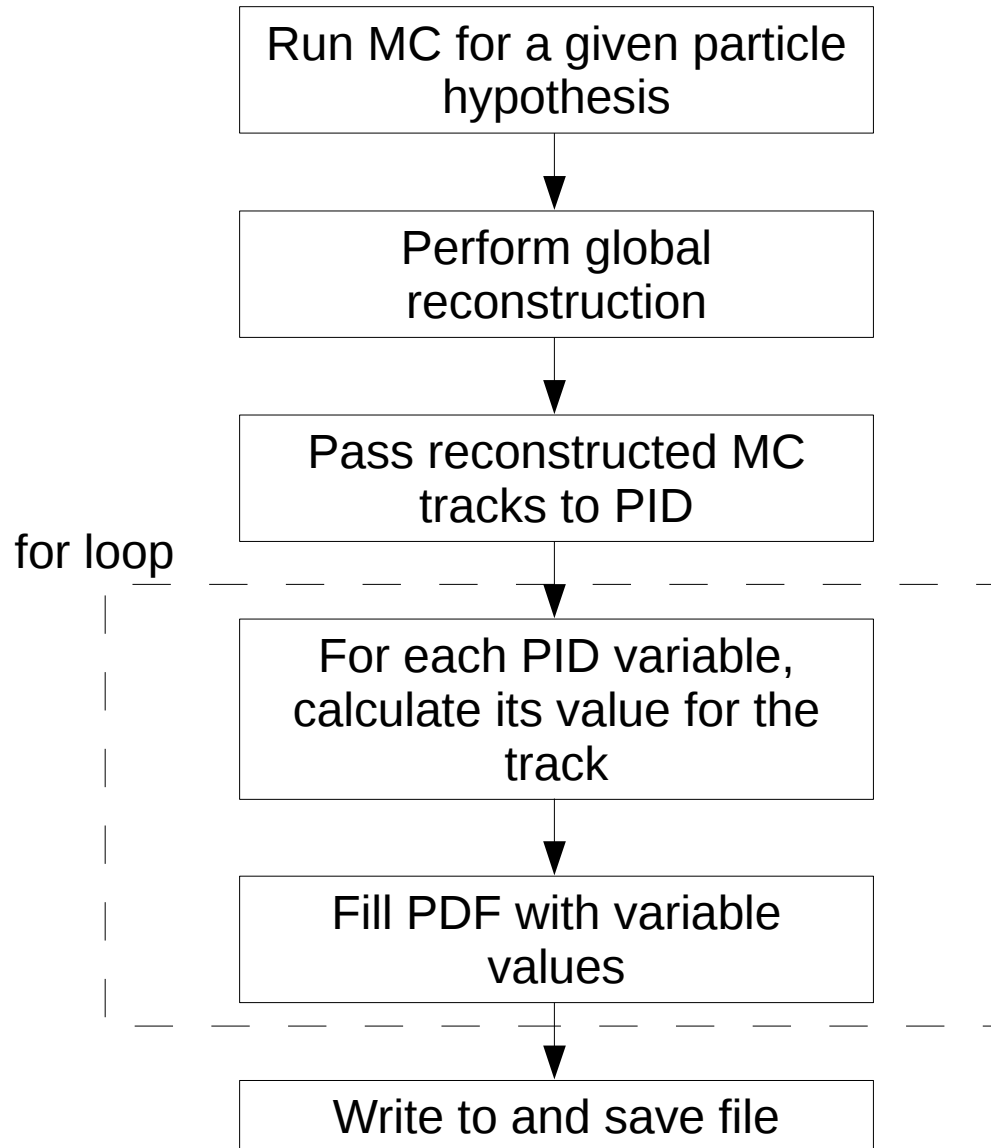
In the example shown to the right, the PDFs for two particles for a given PID variable are shown.

To obtain the log likelihoods for the 3 values to be evaluated, the log of the area of the histogram for that value is taken.

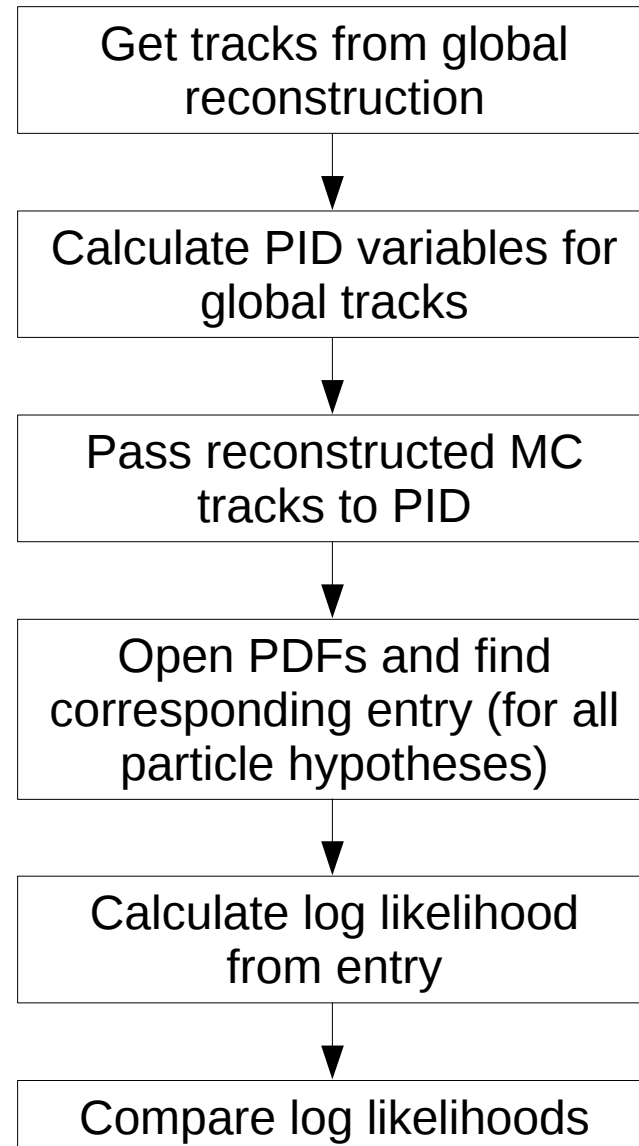


In the case of value 2, the log likelihoods for both particles would be the same, and so taking the difference of their values would not yield a useful result. In the case of either value 1 (or 3), however, the differences between their log likelihoods would indicate that the hypothesis represented by the left (or right) PDF is the most likely given the observed value.

# PDF production



# PDF Use



# Base PID Class

## Functions:

```
//Constructor to create a histogram
PIDBase(std::string variable, std::string hypothesis, int minBin,
int maxBin, int numBins);
//Constructor to use histogram
PIDBase(TFile* file, std::string variable, std::string hypothesis);

~PIDBase();

double logL(MAUS::DataStructure::Global::Track* track);

void Fill_TH1(MAUS::DataStructure::Global::Track* track);

virtual double Calc_Var(MAUS::DataStructure::Global::Track* track)
= 0;
```

## Variables:

```
int _minBin, _maxBin, _numBins;

std::string _var_name, _hyp, _varhyp, _filename, _directory;

TH1F *_hist;

TFile *_writeFile;
```

# PIDVarA

## Functions:

```
PIDVarA(std::string hypothesis);
```

```
PIDVarA(TFile* file, std::string hypothesis);
```

```
~PIDVarA();
```

```
double Calc_Var(MAUS::DataStructure::Global::Track* track);
```

## Variables:

```
TH1F* _histo;
```

```
static const std::string VARIABLE;
```

```
static const int numBins, minBin, maxBin;
```

- Tests for PIDVarA have been written and passed.
- Documentation is a work in progress.
- Deadline of Dec 1st for a working framework for the PID in the code.